

## 8A Declining-balance depreciation

Declining-balance depreciation occurs when the value of the item decreases by a fixed percentage each time period. For example, if you buy a car for $\$ 20000$ and it depreciates by $10 \%$ each year then the value of the car after one year is $\$ 20000-\$ 2000$ or $\$ 18000$. After the second year the value of the car is $\$ 20000-\$ 2000-\$ 1800$ or $\$ 16200$. Notice that the amount of depreciation has decreased in the second year. Depreciation calculations have similarities with compound interest, except that the depreciation is subtracted from the value not added to it.

## DECLINING-BALANCE DEPRECIATION

$S=V_{0}(1-r)^{n}$
$S$ - Salvage value or current value of an item. Also referred to as the book value.
$V_{0}$ - Purchase price of the item. Value of the item when $n=0$.
$r$ - Rate of depreciation per time period expressed as a decimal.
$n$ - Number of time periods.

Example 1: Calculating the declining-balance depreciation
Eva purchased a new car two years ago for $\$ 32000$. During the first year it had depreciated by $25 \%$ and during the second it had depreciated $20 \%$ of its value after the first year. What is the current value of the car?


## SOLUTION:

1 Write the declining-balance depreciation formula.
2 For the first year, substitute $V_{0}=32000, r=0.25$ and $n=1$ into the formula.
3 Evaluate the value of the car after the first year.
4 Write the declining-balance depreciation formula.
5 For the second year substitute $V_{0}=24000, r=0.20$ and $n=1$ into the formula.
6 Evaluate the value of the car after the second year.
7 Write the answer in words.
$=\$ 24000$
$S=V_{0}(1+r)^{n}$
$=32000 \times(1-0.25)^{1}$
$S=V_{0}(1-r)^{n}$
$=24000 \times(1-0.20)^{1}$
$=\$ 19200$
Current value is $\$ 19200$.

Angus buys a car that depreciates at the rate of $26 \%$ per annum. After five years the car has a salvage value of $\$ 17420$. How much did Angus pay for the car, to the nearest dollar?


## SOLUTION:

1 Write the declining-balance depreciation formula.

$$
\begin{aligned}
S & =V_{0}(1-r)^{n} \\
17420 & =V_{0} \times(1-0.26)^{5} \\
V_{0} & =\frac{17420}{(1-0.26)^{5}}
\end{aligned}
$$

2 Substitute $S=17420, r=0.26$ and $n=5$ into the formula.
3 Make $V_{0}$ the subject of the equation.
4 Evaluate.

5 Express the answer correct to the nearest whole dollar.

6 Write the answer in words.
Angus paid $\$ 78504$ for the car.Example 3: Calculating the percentage rate of depreciation

Madison bought a delivery van four years ago for $\$ 27500$. Using the declining-balance method for depreciation, she estimates its present value to be $\$ 8107$. What annual percentage rate of depreciation did she use? Answer to the nearest whole number.


## SOLUTION:

1 Write the declining-balance depreciation formula.
2 Substitute $S=8107, V_{0}=27500$ and $n=4$ into the formula.
3 Make $(1-r)^{4}$ the subject of the equation.

4 Take the fourth root of both sides.

5 Rearrange to make $r$ the subject.

6 Evaluate.
7 Express the answer correct to the nearest whole number.
8 Write the answer in words.

$$
\begin{aligned}
S & =V_{0}(1-r)^{n} \\
8107 & =27500 \times(1-r)^{4} \\
(1-r)^{4} & =\frac{8107}{27500} \\
1-r & =\sqrt[4]{\frac{8107}{27500}} \\
r & =1-\sqrt[4]{\frac{8107}{27500}} \\
& =0.26314528 \\
& =26 \%
\end{aligned}
$$

Rate of depreciation is $26 \%$.

## Exercise 8A

1 A motor vehicle is bought for $\$ 22000$. It depreciates at $16 \%$ per annum and is expected to be used for 5 years. What is the salvage value of the motor vehicle after the following time periods? Answer to the nearest cent.
a 1 year
b 2 years
c 3 years
2 Emma purchased a used car for $\$ 6560$ two years ago. Use the declining-balance method to determine the salvage value of the used car if the depreciation rate is $15 \%$ per annum. Answer to the nearest dollar.

3 Bailey purchased a motor cycle for $\$ 17500$. It depreciates at $28 \%$ per year. Answer to the nearest dollar.
a What is the book value of the motor cycle after 3 years?
b How much has the motor cycle depreciated over the 3 years?
4 A new car is bought for $\$ 52000$. It depreciates at $22 \%$ per annum and is expected to be used for 4 years. How much has the car depreciated over the 4 years? Answer to the nearest dollar.

5 Chloe purchased a car for $\$ 19900$. It depreciates at $24 \%$ per year. Answer to the nearest dollar.
a What is the salvage value of the car after 5 years?
b How much has the car depreciated over the 5 years?
6 The depreciation of a used car over 4 years is shown in the graph below.

a What is the initial value of the used car?
b How much did the used car depreciate during the first year?
c When is the value of the used car $\$ 2000$ ?
d When is the value of the used car $\$ 1500$ ?
e What is the value of the used car after 4 years?
f What is the value of the used car after $1 \frac{1}{2}$ years?

7 A hatchback was purchased for $\$ 16980$ three years ago. By using the declining-balance method of depreciation, find the current value of the hatchback if the annual percentage rate of depreciation is $17.27 \%$. Answer to the nearest dollar.

8 A new car is valued at $\$ 35000$. It has a rate of depreciation of $27.14 \%$.
a What is the value of the new car after one years?
b What is the value of the new car after three years?


Example 39 Philip bought a luxury car that depreciates at the rate of $8.9 \%$ per annum. After five years the car has a salvage value of $\$ 104350$. How much did Philip pay for the car, to the nearest dollar?

10 Mary bought a new car for her business. It depreciates at the rate of $11 \%$ per annum. After four years the car has a salvage value of $\$ 16240$. How much did Mary pay for the car, to the nearest dollar?

11 A motor vehicle is bought for $\$ 32000$. It depreciates at $16 \%$ per annum and is expected to be used for 8 years.
a How much does the motor vehicle depreciate in the first year?
b Copy and complete the following depreciation table for the first five years. Answer to the nearest dollar.

| Year | Current value | Depreciation | Depreciated value |
| :---: | :---: | :---: | :---: |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |

c Graph the value in dollars against the age in years.

## 8B Reducing-balance loans

Reducing-balance loans are calculated on the balance owing and not on the initial amount of money borrowed as with a flat-rate loan ('flat' meaning the interest rate does not change during the life of the loan). As payments are made, the balance owing is reduced and therefore the interest charged is reduced. This can save thousands of dollars on the cost of a loan. The calculations for reducingbalance loans are complicated and financial institutions publish tables related to loans.


## LOAN REPAYMENTS

Total to be paid $=$ Loan payment $\times$ Number of repayments
Total to be paid $=$ Principal + Interest

Example 4: Using a table for a reducing-balance Ioan
The table below shows the monthly repayments for a reducing-balance loan. Calculate the amount of interest to be paid on a loan of $\$ 200000$ over 13 years.

|  | Amount of the loan |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Term | $\mathbf{\$ 1 0 0 0 0 0}$ | $\mathbf{\$ 1 5 0 0 0 0}$ | $\mathbf{\$ 2 0 0 0 0 0}$ | $\mathbf{\$ 2 5 0 0 0 0}$ |
| 12 years | $\$ 1664$ | $\$ 2096$ | $\$ 2794$ | $\$ 3493$ |
| 13 years | $\$ 1700$ | $\$ 2150$ | $\$ 2856$ | $\$ 3569$ |
| 14 years | $\$ 1726$ | $\$ 2218$ | $\$ 2898$ | $\$ 3622$ |

## SOLUTION:

1 Loan is \$200000 and time period is 13 years.
2 Find the intersection value from the table (\$2856).
3 Multiply the intersection value by the number of years and 12 (months in a year) to determine the total to be paid.
4 Substitute the total to be paid (\$445536) and principal (\$200000) into the formula.
5 Evaluate.
6 Write the answer in words.

Total to be paid
$=$ Loan payment $\times$ Number of repayments

$$
\begin{aligned}
& =2856 \times 13 \times 12 \\
& =\$ 445536
\end{aligned}
$$

Total to be paid for the loan is $\$ 445536$.
Total to be paid $=$ Principal + Interest
$445536=200000+I$

$$
=\$ 245536
$$

Interest paid is $\$ 245536$.

The table shows the monthly payments for each $\$ 1000$ borrowed. Molly is planning to borrow $\$ 280000$ to buy a house at $8 \%$ per annum over a period of 20 years.

| Interest rate | Period of loan |  |  |
| :---: | :---: | :---: | :---: |
|  | 10 years | $\mathbf{1 5}$ years | $\mathbf{2 0}$ years |
| $6 \%$ p.a. | $\$ 11.10$ | $\$ 8.44$ | $\$ 7.10$ |
| $7 \%$ p.a. | $\$ 11.61$ | $\$ 9.00$ | $\$ 7.75$ |
| $8 \%$ p.a. | $\$ 12.13$ | $\$ 9.56$ | $\$ 8.36$ |

a What is Molly's monthly payment on this loan?
b How much would Molly pay in total to repay this loan?
c How much would Molly save if she repaid the loan over 15 years?

## SOLUTION:

1 Find the intersection value from the table for interest rate $8 \%$ p.a. and time period 20 years.
2 Multiply the intersection value by the number of thousands borrowed (280).
3 Multiply the monthly repayment by the number of years and 12 (months in a year) to determine the total to be paid.
4 Evaluate.
5 Write the answer in words.
6 Repeat the above calculations using 15 years instead of 20 years.

7 Subtract the total to be paid for 15 years from the total to be paid for 20 years.
8 Evaluate.
9 Write the answer in words.
a $\$ 8.36$

Monthly repayment $=\$ 8.36 \times 280$ $=\$ 2340.80$
b Total to be paid
$=$ Loan repayment $\times$ Number of repayments
$=2340.80 \times 20 \times 12$
$=\$ 561792$
Total to be paid for the loan is $\$ 561792$.
c 15 years
Monthly repayment $=\$ 9.56 \times 280$

$$
=\$ 2676.80
$$

Total to be paid
$=$ Loan repayment $\times$ Number of repayments
$=2676.80 \times 15 \times 12$
$=\$ 481824$
Amount saved $=\$ 561792-\$ 481824$

$$
=\$ 79968
$$

The amount saved is $\$ 79968$.

## Fees and charges for a loan

Banks and financial institutions charge their customers for borrowing money. A loan account is created and an account service fee is charged per month. In addition to this fee there are a number of other loan fees and charges, depending on the financial institution. Many of these fees are negotiable and customers are advised to compare the fees and charges with the interest rate charged. Fees and charges for a loan may include:

- loan application fee - costs in setting up the loan.
- loan establishment fee - initial costs in processing the loan application.
- account service fee - ongoing account-keeping fee.
- valuation fee - assessment of the market value of a property.
- legal fee - legal processing of a property.


## Graph of a reducing-balance Ioan

The graph below shows the amount owed after each month on a reducing-balance loan. The amount borrowed is $\$ 50000$ at an interest rate of $10 \%$ p.a. It illustrates the difference between making repayments of $\$ 500$ per month and making repayments of $\$ 1000$ per month. When paying $\$ 500$ a month, it takes 215 months to pay off the loan, and the interest charged is $\$ 57500$. However, when paying $\$ 1000$ a month, it only takes 65 months to pay off the loan, and the interest charged is $\$ 15000$. Each graph is a gradual curve as each payment reduces the amount owed and slowly decreases the interest charged.


## Exercise 8B

1 Tyler is considering an investment loan from the bank at an interest rate of $9.9 \%$ p.a. reducible. The table below shows the monthly repayment for an investment loan.

| Term | Investment loan |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\$ \mathbf{5 0 0 0 0}$ | $\$ 75000$ | $\$ 100000$ | $\$ \mathbf{1 2 5 0 0 0}$ | $\$ \mathbf{1 5 0 0 0 0}$ |
| 5 years | $\$ 1060$ | $\$ 1590$ | $\$ 2120$ | $\$ 2650$ | $\$ 3180$ |
| 10 years | $\$ 658$ | $\$ 987$ | $\$ 1316$ | $\$ 1645$ | $\$ 1974$ |
| 15 years | $\$ 534$ | $\$ 801$ | $\$ 1068$ | $\$ 1336$ | $\$ 1603$ |

a What is the monthly repayment for a loan of $\$ 75000$ over 15 years?
b What is the monthly repayment for a loan of $\$ 150000$ over 10 years?
c What is the monthly repayment for a loan of $\$ 100000$ over 5 years?
d What is the monthly repayment for a loan of $\$ 50000$ over 15 years?
e What is the monthly repayment for a loan of $\$ 125000$ over 5 years?
2 Kevin is applying for an investment loan from a bank of $\$ 75000$ over 5 years using the table in question 1.
a What is the monthly repayment?
b What is the total amount paid for this loan?
c What is the interest paid on this loan?


3 The table below shows the monthly repayments per \$1000 on a bank loan.

| Term | $\mathbf{7 . 0 0 \%}$ | $\mathbf{7 . 2 5 \%}$ | $\mathbf{7 . 5 0 \%}$ | $\mathbf{7 . 7 5 \%}$ |
| :---: | :---: | :---: | :---: | :---: |
| 10 years | $\$ 16.39$ | $\$ 16.78$ | $\$ 17.18$ | $\$ 17.58$ |
| 15 years | $\$ 15.33$ | $\$ 15.87$ | $\$ 16.44$ | $\$ 17.02$ |

Calculate the monthly repayment on the following loans.
a $\$ 310000$ at $7.50 \%$ p.a. for 15 years
b $\$ 120000$ at $7.00 \%$ p.a. for 10 years
c $\$ 450000$ at $7.75 \%$ p.a. for 10 years
d $\$ 180000$ at $7.25 \%$ p.a. for 15 years

4 Blake is borrowing $\$ 35000$ at $7 \%$ p.a. for 10 years. Use the table in question 3 to answer these questions.
a What is the monthly repayment?
b How much interest will he pay?

5 The table below shows the monthly payments for a loan of $\$ 1000$ for varying interest rates. Jack is planning to borrow $\$ 340000$ to buy a house at $10 \%$ p.a. over a period of 15 years.

| Interest rate | Period of loan |  |  |
| :---: | :---: | :---: | :---: |
|  | 10 years | $\mathbf{1 5}$ years | 20 years |
| 7\% p.a. | $\$ 11.61$ | $\$ 9.00$ | $\$ 7.75$ |
| $8 \%$ p.a. | $\$ 12.13$ | $\$ 9.56$ | $\$ 8.36$ |
| $9 \%$ p.a. | $\$ 12.67$ | $\$ 10.14$ | $\$ 9.00$ |
| $10 \%$ p.a. | $\$ 13.22$ | $\$ 10.75$ | $\$ 9.65$ |

a Calculate Jack's monthly payment on this loan.
b How much does Jack pay in total to repay this loan?
c How much interest does Jack pay on this loan?
d How much would Jack save if he repaid the loan over 10 years?
6 Hannah and Mitchell borrow $\$ 180000$ over 20 years at a reducible interest rate of $8.5 \%$ p.a. They pay $\$ 1754$ per month.
a Calculate the total amount to be paid on this loan.
b How much interest do they pay on the loan?


Home loan


## 8 Credit cards

Credit cards are used to buy goods and services and pay for them later. The time when interest is not charged on your purchases is called the interest-free period. If payment is not received when the statement is due then interest is charged from the date of purchase. Interest on credit cards is usually calculated daily on the outstanding balance using compound interest.

The interest rate is usually much higher than for other kinds of loans and credit facilities.


## CREDIT CARDS

Daily interest rate $=\frac{\text { Annual interest rate }}{365}$
$F V=P V(1+r)^{n} \quad I=F V-P V$
$F V$ - Amount owing on the credit card
$P V$ - Principal is the purchases made on the credit card plus the outstanding balance
$r$ - Rate of interest per compounding time period expressed as a decimal
$n$ - Number of compounding time periods
$I$ - Interest (compound) charged on the outstanding balance

## Example 6: Calculating the cost of using a credit card

Samantha has a credit card with a compound interest rate of $18 \%$ p.a. and no interest-free period. Samantha used her credit card to pay for clothing costing $\$ 280$. She paid the credit card account 14 days later. What is the total amount she paid for the clothing, including the interest charged?

## SOLUTION:



1 Write the formula for compound interest.
2 Substitute $P=280, r=(0.18 \div 365)$ and $n=14$ into the formula.
3 Evaluate.
4 Express the answer correct to two decimal places.
5 Answer the question in words.
$F V=P V(1+r)^{n}$
$=280\left(1+\frac{0.18}{365}\right)^{14}$
$=281.9393596$
$=\$ 281.94$
Clothing costs \$281.94

## Exercise 8C

1 A credit card has a daily interest rate of $0.05 \%$ per day. Find the interest charged on these outstanding balances. Answer correct to the nearest cent.
a $\$ 840$ for 12 days
b $\$ 742.40$ for 20 days
c $\$ 5680$ for 30 days
d $\$ 128$ for 18 days
e $\$ 240$ for 6 days
f $\$ 1450$ for 15 days

2 Joel has a credit card with an interest rate of $0.04 \%$ compounding per day and no interest-free period. He uses his credit card to pay for a mobile phone costing $\$ 980$. Calculate the total amount paid for the mobile phone if Joel paid the credit card account in the following time period. Answer correct to the nearest cent.
a 10 days later
b 20 days later
c 30 days later
d 40 days later
e 50 days later
f 60 days later


3 Calculate the compound interest charged on these outstanding balances. Answer correct to the nearest cent.
a Balance $=\$ 6820$, Daily interest rate of $0.08 \%$, Time period 70 days
b Balance $=\$ 23648$, Daily interest rate of $0.06 \%$, Time period 35 days
c Balance $=\$ 1550$, Daily interest rate of $0.05 \%$, Time period 20 days
d Balance $=\$ 35800$, Daily interest rate of $0.09 \%$, Time period 100 days
e Balance $=\$ 4500$, Daily interest rate of $0.05 \%$, Time period 27 days
$f$ Balance $=\$ 7680$, Daily interest rate of $0.04 \%$, Time period 180 days

4 Andrew's credit card charges $0.045 \%$ compound interest per day on any outstanding balances. How much interest is Andrew charged on an amount of $\$ 450$, which is outstanding on his credit card for 35 days? Answer correct to the nearest cent.

5 Olivia received a new credit card with no interest-free period and a daily compound interest rate of $0.05 \%$. She used her credit card to purchase food for $\$ 320$ and petrol for $\$ 50$ on 18 July. This amount stayed on the credit card for 24 days. What is the total interest charged? Answer correct to the nearest cent.

6 Jett used his credit card to buy a holiday to New Zealand. The cost of the package was $\$ 6500$. The charge on the credit card is $1 \%$ interest per month on the unpaid balance. How much does Jett owe for his holiday after six months? Answer correct to the nearest cent.

7 Calculate the amount owed, to the nearest cent, for each of the following credit card transactions. The credit card has no interest-free period.
a Transactions $=\$ 540$, Compound interest rate $=14 \%$ p.a., Time period $=15$ days
b Transactions $=\$ 270$, Compound interest rate $=11 \%$ p.a., Time period $=9$ days
c Transactions $=\$ 1400$, Compound interest rate $=18 \%$ p.a., Time period $=22$ days
d Transactions $=\$ 480$, Compound interest rate $=16 \%$ p.a., Time period $=18$ days
e Transactions $=\$ 680$, Compound interest rate $=10 \%$ p.a., Time period $=9$ days

8 Calculate the interest charged for each of the following credit card transactions. The credit card has no interest-free period. Answer correct to the nearest cent.
a Transactions $=\$ 680$, Compound interest rate $=15 \%$ p.a., Time period $=20$ days
b Transactions $=\$ 740$, Compound interest rate $=12 \%$ p.a., Time period $=13$ days
c Transactions $=\$ 1960$, Compound interest rate $=17 \%$ p.a., Time period $=30$ days
d Transactions $=\$ 820$, Compound interest rate $=21 \%$ p.a., Time period $=35$ days
e Transactions $=\$ 1700$, Compound interest rate $=19 \%$ p.a., Time period $=32$ days

9 Luke has a credit card with a compound interest rate of $18.25 \%$ per annum.
a What is the daily percentage interest rate, correct to two decimal places?
b Luke has an outstanding balance of $\$ 4890$ for a period of 30 days. How much interest, to the nearest cent, will he be charged?

10 Alyssa uses a credit card with a no interest-free period and a compound interest rate of $15.5 \%$ p.a. from the purchase date. During April she makes the following transactions.

| Transaction details |  |  |
| :--- | :--- | ---: |
| 04 April | IGA Supermarket | $\$ 85.00$ |
| 09 April | KMart | $\$ 115.00$ |
| 12 April | David Jones | $\$ 340.00$ |
| 27 April | General Pants | $\$ 80.00$ |
| 28 April | JB HiFi | $\$ 30.00$ |

a What is the daily compound interest rate, correct to three decimal places?
b Alyssa's account is due on 30 April. What is the total amount due if you disregard the amount of interest to be paid?
c How much interest has Alyssa paid on the IGA transaction during the month? Answer correct to the nearest cent.
d How much interest has Alyssa paid on the KMart transaction during the month? Answer correct to the nearest cent.

## 8D Credit card statements

Credit card statements are issued each month and contain information such as account number, opening balance, new charges, payments, refunds, reward points, payment due data, minimum payment and closing balance. The credit card statement includes the date and cost of each purchase and could be regarded as a ledger. A ledger documents your spending.

If the minimum payment is not made by the due date, the consequences can be expensive. You may be charged a late payment fee and, of course, you will be charged interest on it.

Example 7: Reading a credit card statement

| Your Bank |  |  |  |
| :---: | :---: | :---: | :---: |
| Your Bank of Australia |  | Page number 1 of 2 |  |
| ABN 12345678901 |  |  |  |
|  |  | Statement begins | 5 Oct |
|  |  | Statement ends | 5 Nov |
| MR JOHN CITIZEN |  | Enquiries |  |
|  |  | Credit Card | 132221 |
| 123 SAMPLE STREET |  | (24 hours a day, 7 days a week) |  |
| SUBURBIA NSW 2000 |  | Your Bank Awards |  |
|  |  | (8am to 8pm Mon-Fri) |
| MasterCard 5353180100010001 |  |  | Payment due date |  |
| Opening balance | \$207.72 | 30th |  |
| New charges | \$460.14 | Mini |  |
| Payments/refund | -\$207.72 | \$25.00 |  |
|  |  | Closing balance |  |
|  |  | \$460.14 |  |
| Your Bank Awards 1000123456 |  | Total Points Balance |  |
| Opening points balance | 50,500 | 34,910 |  |
| Total points earned | 460 |  |  |
| points redeemed | -15,600 |  |  |

Answer the following questions using the above credit card statement.
a What is the credit card account number?
C What is the payment due date?
e What is the closing balance?

## SOLUTION:

1 Read the number after 'MasterCard'.
2 Read 'Opening balance'.
3 Read the box 'Payment due date'.
4 Read the box 'Minimum payment'.
5 Read the box 'Closing balance'.
b What is the opening balance?
d What is the minimum payment?

## Exercise 8D

1 Use the credit card statement opposite to answer these questions.
a What is the due date?
b What is the cost of the purchases?
c What is the closing account balance?
d What is the minimum amount due?
e What payment was made last month?
f How much interest was charged?
g What was the opening balance?
h What is the cardholder's credit balance?

2 The transactions on a credit card are shown below.
a What is the credit limit?
b What is the account balance?
c How many transactions are shown?
d What is the available credit?

| Account summary |  |
| :--- | ---: |
| Opening balance | $\$ 743.42$ |
| Payments and other credits | $\$ 743.42$ |
| Purchases | $\$ 172.91$ |
| Cash advances | $\$ 0.00$ |
| Interest and other charges | $\$ 0.00$ |
| Closing account balance | $\$ \mathbf{1 7 2 . 9 1}$ |
| Cardholder credit balances | 4511.88 |
| Payment summary | $\$ 4684.79$ |
| Card balances renewal | $\$ 10.00$ |
| Monthly payment | $\mathbf{2 1} \mathbf{A p r}$ |
| Due date | $\$ \mathbf{1 0 . 0 0}$ |


| Account summary |  |  |  |
| :--- | :--- | :--- | ---: |
| Available credit | Account balance | Credit limit |  |
| $\$ 15549.18$ | $\$ 3950.82$ |  |  |
|  | Payment due date |  | Minimum payment due |
|  | 7 Dec |  |  |
| Last 5 transactions View more |  |  |  |
| Date | Transaction description | Debit |  |
| 30 Nov | WW Petrol | $\$ 24.38$ |  |
| 29 Nov | Coles | $\$ 55.03$ |  |
| 29 Nov | Woolworths | $\$ 34.63$ |  |
| 28 Nov | Myer | $\$ 49.13$ |  |
| 28 Nov | David Jones | $\$ 23.40$ |  |

e How much was spent on 29 November?
f How much was spent on 28 November?
g Where was $\$ 49.13$ spent on 28 November?
h Where was $\$ 24.38$ spent on 30 November?
i What is the payment due date?
j What is the minimum amount due?

3 Create the spreadsheet below.


| C10 |  | $f_{x} \mid=\operatorname{SUM}(\mathrm{C5}: \mathrm{C9})$ |  |
| :---: | :---: | :---: | :---: |
| - | A | B | C |
| 1 |  |  |  |
| 2 | Worksheet to create a ledger |  |  |
| 3 |  |  |  |
| 4 | Date | Details | Amount |
| 5 | 20-Nov | Manly Vale Pharmacy Manly Vale | -\$20.00 |
| 6 | 25-Nov | Manly Vale Pharmacy Manly Vale | -\$18.95 |
| 7 | 01-Dec | Virgin Mobile North Sydney | -\$25.00 |
| 8 | 05-Dec | Target 78 Brookvale | -\$12.99 |
| 9 | 05-Dec | Pulse Warringah Brookvale | -\$30.98 |
| 10 |  |  | -\$107.92 |

a How many transactions are shown on the ledger?
b How much has been spent at Manly Vale Pharmacy?
c If the account begins on 15 November and ends on 14 December, how many days does it account for?
d If the card has a $\$ 5000$ credit limit, what is the available credit on 14 December?
e If the minimum payment is $\$ 10$ and is paid on the due date, what is the balance owing?
f This credit card charges $0.06 \%$ per day compound interest on the unpaid balance. What is the interest charged per day on the closing balance? Answer to the nearest cent.

4 Consider the credit card statement shown opposite.
a What is the opening balance?
b What is the credit limit?
c What is the available credit?
d What is the closing balance?
e How much has been spent on purchases, cash advances and special promo debits this month?
f How much interest and other charges were

| Visa Account number | $\mathbf{4 5 5 7 0 7 5 6 0 8 3 3 1 2 3 4}$ |
| :--- | :---: |
| Credit limit | $\$ 12,000$ |
| Available credit | $\$ \mathbf{6 , 3 6 1}$ |
| Account summary | $\$ 5,821.31 \mathrm{DR}$ |
| - Opening balance | $\$ 781.25 \mathrm{CR}$ |
| + Payment \& other credits received | $\$ 511.93 \mathrm{DR}$ |
| - Purchases, cash advances \& special <br> promo debits | $\$ 86.26 \mathrm{DR}$ |
| - Interest \& other charges | $\$ 5,638.25 \mathrm{DR}$ |
| = Closing balance |  | incurred last month?

This credit card charges $0.05 \%$ per day compound interest on the unpaid balances.
g What is the interest charged per day on the closing balance? Answer to the nearest cent.
h How much interest would be accrued on the closing balance for a year? Answer to the nearest cent.

## 8 E Fees and charges for credit card usage

Banks and financial institutions charge their customers an annual card fee for maintaining a credit card account. In addition to this fee, customers may be charged fees for late payment, cash advances and balance transfers. The late payment fee applies if the minimum payment has not been received by the due date. Interest is charged for retail purchases and the amount still owing from the previous month.

## FEES AND CHARGES FOR CREDIT CARD USAGE

- Annual card fee - maintaining credit card account
- Interest charge - interest charged for retail purchases
- Late payment fee - when minimum payment has not been received by the due date
- Cash advances - withdrawing cash from the credit card account
- Balance transfers - moving balance to another account, often held at another institution

Hilary has a debit of $\$ 6000$ on a credit card with an interest rate of $14.75 \%$ p.a. that compounds daily. She decided to transfer the balance to a new card with a $0 \%$ balance transfer for 6 months. However, after 6 months the new card reverted to an interest rate of $19.75 \%$ p.a that compounds daily. Is Hilary better off after 12 months?


## SOLUTION:

1 Write the formula.
2 Substitute $P V=6000, r=0.1475$ and $n=365$ into the formula.

Old card $F V=P V(1+r)^{n}$
$=\$ 6000\left(1+\frac{0.1475}{365}\right)^{365}$
$\approx \$ 6953.39$
4 Write the formula.
5 Substitute $P V=6000, r=0.1975$ and $n=182.5$ ( 6 months only) into the formula.
6 Evaluate correct to two decimal places.
New card $F V=P V(1+r)^{n}$
$=\$ 6000\left(1+\frac{0.1975}{365}\right)^{182.5}$
3 Evaluate correct to two decimal places.

Calculate the saving by subtracting the future value of the new card from the old card.

8 Write the answer in words.

$$
\begin{aligned}
\text { Saving } & =\$ 6953.39-\$ 6622.57 \\
& =\$ 330.82
\end{aligned}
$$

Hilary is better off with the new card by \$330.82.

## Exercise 8E

1 Alicia's bank charged an annual credit card fee of $\$ 350$, a cash advance fee of $\$ 2.50$ and a late payment fee of $\$ 20$. Calculate Alicia's banking costs for the year if she made:
a 11 cash advances and 4 late payments
b 20 cash advances and 12 late payments
c 50 cash advances and 6 late payments
d 0 cash advances and 12 late payments
e 100 cash advances and 0 late payments
f 0 cash advances and 0 late payments.
2 The table below shows the credit card usage charges for four banks.

| Bank | Annual fee | Cash advance | Late payment |
| :--- | :---: | :---: | :---: |
| A | $\$ 225$ | $\$ 2.00$ | $\$ 15$ |
| B | $\$ 200$ | $\$ 2.20$ | $\$ 20$ |
| C | $\$ 250$ | $\$ 1.80$ | $\$ 12$ |
| D | $\$ 240$ | $\$ 1.90$ | $\$ 16$ |

a What is the cost of the cash advance fee at bank B?
b What is the cost of the late payment fee at bank D?
c Which bank has the lowest annual fee?
d Which bank has the highest cash advance fee?
e Calculate the difference between the late payment fees at bank C and bank D .
f Calculate the difference between the cash advance fees at bank B and bank C.
$g$ What is the average annual fee for these banks?
h What is the average late payment fee for these banks?
i What are the annual banking costs for 30 cash advances and 1 late payment at:
i Bank A?
ii Bank B?
iii Bank C?
iv Bank D?
j What are the annual banking costs for 100 cash advances and 6 late payments at:
i Bank A?
ii Bank B?
iii Bank C?
iv Bank D?
3 Elijah's bank charged an annual credit card fee of $\$ 320$, cash advance fee of $\$ 2.30$ and late payment fee of $\$ 18$. What are Elijah's banking costs for the year if he made 80 cash advances and had 1 late payment fee?

## Key ideas and chapter summary

Declining-balance
depreciation
educing-balance loans

Fees and charges for a loan

Credit cards

$$
S=V_{0}(1-r)^{n}
$$

$S$ - Salvage value or current value
$V_{0}$ - Purchase price of the item $r$ - Rate of interest per time period (decimal) $n$ - Number of time periods

Total to be paid $=$ Loan repayment $\times$ Number of repayments
Total to be paid $=$ Principal + Interest

- Loan application fee - costs in setting up the loan
- Loan establishment fee - initial costs in process the loan application
- Account service fee - ongoing account-keeping fee.
- Valuation fee - assessment of the market value of a property.
- Legal fee - legal processing of a property.

Daily interestrate $=\frac{\text { Annual interest rate }}{365}$
$F V=P V(1+r)^{n}$ and $I=F V-P V$
$F V$ - Future value or the amount owing on the credit card
$P V$ - Present value or the purchases made on the credit card
$r$ - Rate of interest per compounding time period as a decimal
$n$ - Number of compounding time periods
$I$ - Interest (compound) charged for the use of their credit card
Credit card statements Credit card statements are issued each month and contain information such as account number, opening balance, new charges, payments, refunds, reward points, payment due data, minimum payment and closing balance.

Fees and charges for credit card usage

- Annual card fee - maintaining credit card account
- Interest charge - interest charged for retail purchases
- Late payment fee - when minimum payment has not been received by the due date
- Cash advances - withdrawing cash from the credit card account
- Balance transfers - moving balance to another account, often held at another institution


## Multiple-choice

1 A new car bought for $\$ 39000$ depreciates at $25 \%$ per annum and is expected to be used for 4 years. How much is the car worth after 4 years?
A $\$ 9390$
B $\$ 9750$
C $\$ 12340$
D $\$ 29250$

2 The table shows the monthly repayment of $\$ 1000$ on a reducing-balance loan. What is the monthly repayment on $\$ 290000$ at $8.75 \%$ for 20 years?

| Term | $8.00 \%$ | $8.25 \%$ | $8.50 \%$ | $8.75 \%$ |
| :--- | :--- | :--- | :--- | :--- |
| 20 years | $\$ 6.38$ | $\$ 6.77$ | $\$ 7.17$ | $\$ 7.57$ |

A $\$ 1850.20$
B $\$ 1963.30$
C $\$ 2079.30$
D $\$ 2195.30$

3 Lachlan borrows $\$ 245000$ over 20 years at a reducible interest rate of $6.5 \%$ p.a. He pays $\$ 1856$ per month. What is the total paid on this loan?
A $\$ 200440$
B \$318500
C $\$ 445440$
D $\$ 563500$

4 A credit card has a compound interest rate of $16 \%$ p.a. (no interest free period). Find the interest charged on $\$ 4200$ for 30 days. Answer correct to the nearest dollar.
A $\$ 22$
B \$56
C $\$ 674$
D \$4256

5 A credit card has a daily interest rate of $0.05 \%$ per day (no interest free period). Find the interest charged on $\$ 1530$ for 14 days. Answer correct to the nearest cent.
A $\$ 0.77$
B \$10.74
C $\$ 76.50$
D \$1540.74

6 Elijah's bank charged an annual credit card fee of $\$ 320$, cash advance fee of $\$ 2.30$ and late payment fee of $\$ 18$. What are Elijah's banking costs for the year if he made 80 cash advances and had 1 late payment fee?
A $\$ 202.00$
B $\$ 340.30$
C $\$ 504.00$
D \$522.00

7 Michael has a debt of $\$ 16000$ on a credit card with a compound interest rate of $14 \%$ p.a. He decided to transfer the balance to a new card with a $0 \%$ balance transfer for 6 months. How much does he save in the first 12 months if the new card has an interest rate of $16 \%$ p.a.?
A 1008
B $\$ 1232$
C $\$ 2240$
D \$18240

## Short-answer

1 Alexis purchased a car for $\$ 19900$. It depreciates at $24 \%$ per year.
a What is the salvage value of the car after 5 years? Answer to the nearest dollar.
b How much has the car depreciated over the 5 years?
2 Paige takes out a loan of $\$ 21000$ over 36 months. The repayment rate is $\$ 753.42$ per month. a How much will Paige pay back altogether? Answer to the nearest dollar.
b What was the interest charged on Paige's loan?
3 James borrows $\$ 280000$ and repays the loan in equal fortnightly repayments of $\$ 1250$ over 20 years. What was the interest charged on James's loan?

4 Madison has a credit card with an interest rate of $17 \%$ p.a. compounding daily and no interestfree period. Madison used her credit card to pay for shoes costing $\$ 170$. She paid the credit card account 26 days later. What is the total amount she paid for the shoes including the interest charged? Answer to the nearest cent.

5 Hayley's bank charged an annual credit card fee of $\$ 300$, a cash advance fee of $\$ 4.00$ and a late payment fee of $\$ 20$. Calculate Hayley's banking costs for the year if she made:
a 9 cash advances and 5 late payments
b 15 cash advances and 7 late payments.

6 Benjamin uses a credit card with a no interest-free period and a compound interest rate of $18.5 \%$ p.a. compounding daily from and including the purchase date and due date. Benjamin's account is due on February 28. During February he makes the following transactions.

| Transaction Details |  |  |
| :--- | :--- | :--- |
| 06 February | Coles | $\$ 278.00$ |
| 07 February | Myer | $\$ 87.00$ |
| 18 February | Big W | $\$ 259.00$ |
| 18 February | Jag | $\$ 120.00$ |
| 20 February | Bunnings | $\$ 460.00$ |
| 21 February | Woolworths | $\$ 300.00$ |

How much interest will Benjamin pay during the month on the following transactions? Answer correct to the nearest cent.
a Coles transaction
b Big W transaction
c Bunning transaction

7 Transactions on a credit card with an interest rate of $20 \%$ p.a. are shown below.

| $\begin{array}{l}\text { Post } \\ \text { date }\end{array}$ | $\begin{array}{l}\text { Tran } \\ \text { date }\end{array}$ | Description | Amount |
| :--- | :--- | :--- | :---: |
| $\begin{array}{l}\text { Derrick Tan }\end{array}$ |  |  | 4512-XXXX-XXXX-6650 |$]$.

a What is the previous statement balance?
b How much was paid on 26 May?
c What is the balance owing on 1 Jun?
d How much did Danielle Tan spend on 13 Jun?
e What is the balance owing on 14 Jun?
f How much was spent at Harvey Norman on 15 Jun?
g How much was the finance charge?
h What is the closing balance?
i How much interest would be paid on the closing balance for a year?
j How much interest would be paid on the closing balance for two years?
8 Marcus has a debit of $\$ 12000$ on a credit card with an interest rate of $13 \%$ p.a. He decided to transfer the balance to a new card with a $0 \%$ balance transfer for 6 months. However, after 6 months the new card reverted to an interest rate of $21.25 \%$ p.a. Is Marcus better off after 24 months? Answer to the nearest dollar.

9 A credit card statement shows a closing balance of $\$ 5620.60$ and a charge of $0.06 \%$ per day compound interest on the unpaid balances. What is the interest charged per day on the closing balance? Answer to the nearest cent.

10 Jenny's bank charged an annual credit card fee of $\$ 400$, cash advance fee of $\$ 4.30$ and late payment fee of $\$ 14$. What are Jenny's banking costs for the year if she made 80 cash advances and had 3 late payment fees?

